Health and employment

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Costs associated with illness are significant. In 1998, the latest year for which figures are available, the economic burden of illness stood at $159.4 billion—$83.9 billion in direct costs (hospital care, drugs, physician care, care in other institutions, and additional direct health expenditures) and $75.5 billion in indirect costs of mortality and long-term and short-term disability (Health Canada 2002).[1]

This study examines the relationship between health status and labour market outcomes for working-age men and women (ages 15 to 64). If health problems lead to lower labour productivity, participation or supply (hours worked), then they impose a cost on the economy in terms of production loss.[2] Hence, a better understanding of the relationship between health and labour market activities enables better estimates of the costs of health limitations. And, given the aging of the population—in 2008, 28% were age 45 to 64 compared with 19% in 1991—coupled with the health problems and disabilities associated with aging, the relationship between health and labour market behaviour becomes more pressing. In addition, other implications of poor health include employers' sick leave costs,[3] Employment Insurance sickness benefits, increased dependence on Canada Pension Plan disability benefits, and employer costs to accommodate workers with limitations.

Previous studies have dealt primarily with physical health, even though one in five Canadians is predicted to experience a mental illness during their lifetime, with most beginning during adolescence or young adulthood (Health Canada 2006). In addition, most of the literature deals with the U.S. population and focuses mainly on older working-age men because of an increase in the incidence of early retirement. The few Canadian studies focus mostly on disability.[4]

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This paper uses the 2002 Canadian Community Health Survey (CCHS): Mental Health and Well-being (Cycle 1.2) to study the relationship between health status and labour market behaviour (see *Data source and definitions*). Because the CCHS is a health survey, it thoroughly identifies health conditions. In addition, Cycle 1.2 has a strong focus on mental health, which is more or less ignored by other surveys and not covered in as much

Data source and definitions

The **Canadian Community Health Survey** (CCHS) collects information related to health status, health care utilization and health determinants for the Canadian population. Information for 2002 (Mental Health and Well-being, Cycle 1.2) for the 10 provinces was collected between May and December 2002. The survey covered the civilian population age 15 or older, living in private dwellings. Excluded from the sampling frame are reserves and Crown lands, health care institutions, and certain remote regions.[5]

The sample was restricted to the working-age population, age 15 to 64. Individuals were considered to be employed if they worked at, or were absent from, a job or a business in the previous week. This included part-time jobs, seasonal work, contract work, self-employment, babysitting and any other paid work, regardless of the number of hours worked. Hours worked were defined as annual hours worked and were calculated by multiplying usual weekly hours of work by weeks worked in the 12 preceding months.

Four measures of health status were used: self-reported physical and mental health, presence of a chronic condition or a mental health condition (health conditions had to be long term and diagnosed by a health professional), number of chronic physical and mental health conditions, and self-reported change in health status over the past year.

Some limitations apply. First, the data set is cross-sectional and hence unobserved heterogeneity cannot be accounted for. Second, information on the severity of a health problem is not available. However, one of the health status measures used is number of health problems, which might serve as a proxy for severity. Third, hourly earnings are not available. These are commonly used as a control in the hours worked regression. But the models do include information on age, education, occupation and job characteristics, which are all determinants of earnings. Fourth, annual hours worked are based on usual hours and weeks worked. However, this is usually the best proxy available.

Table 1 Health characteristics of the working-age population, 15 to 64 years of age[1]

	Men	Women
	number	
Observations	13,126	14,590
	%	
Employed	80.5	69.4
Self-reported physical health		
Good/very good/excellent	89.9	88.0
Fair/poor	10.1	12.0
Self-reported mental health		
Good/very good/excellent	94.3	92.7
Fair/poor	5.8	7.3
Chronic physical conditions		
None	54.3	46.2
One	26.5	26.8
Two	11.8	13.7
Three or more	7.4	13.4
Mental health problems		
None	84.8	82.4
One	9.7	9.6
Two	3.2	4.9
Three or more	2.3	3.1
Change in health status		
Compared with one year ago current health status is:		
Much better/somewhat better/ about the same	90.2	89.4
Worse/much worse	9.8	10.6

1. Weighted percentages.
Source: Statistics Canada, 2002 Canadian Community Health Survey, Cycle 1.2, Mental Health and Well-being.

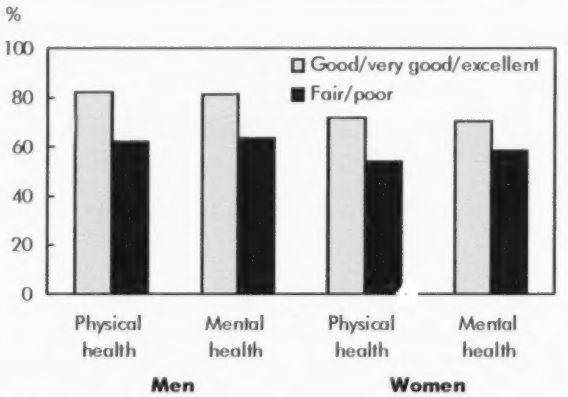
depth by the other cycles of CCHS. Employment and hours worked are both captured. Various health status definitions and estimation techniques are used to check the robustness of the results. The paper also uses models to address the possibility of two-way causality between health and employment.

Overview

The advantage of CCHS Cycle 1.2 is its strong focus on mental health, an issue that has been largely ignored until recently. Approximately 10% of men and 12% of women reported fair or poor physical health (Table 1). Also, 6% of men and 7% of women classified their mental health as fair or poor. Almost one-half of the population (46% men and 54% women) had at least one chronic physical condition. And 15% of men and 18% of women reported at least one mental health problem. The most common physical problem among men was back problems (20%), followed by high blood pressure (11%), arthritis/rheumatism (10%) and asthma (7%). Among women, back problems were also the most common (20%), followed by migraine headaches (17%), arthritis/rheumatism (15%) and asthma (10%). The most common mental health problems for men were substance dependence (5%), anxiety disorders and major depression (both 4%) and learning disabilities (3%).[6] For women, they were anxiety disorders and major depression (both 6%), social phobias (4%) and eating disorders (3%). Respondents were also asked about changes in health over time. Compared with the previous year, 10% of men and 11% of women reported their current health as worse or much worse.

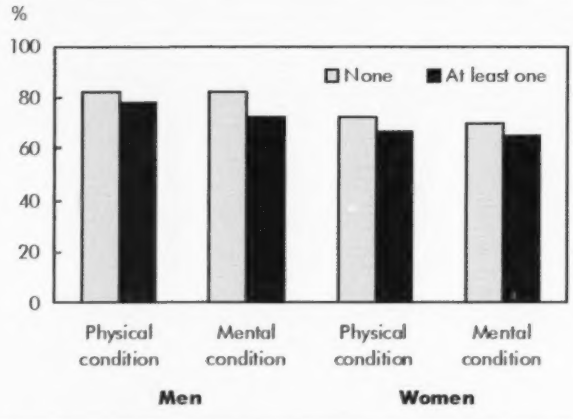
Health problems are clearly associated with adverse employment outcomes (Chart A). Whereas 83% of men and 72% of women with good to excellent physical health were employed, only 62% and 54% of those with fair or poor physical health had a job. Similarly for mental health, 82% of men and 70% of women with good to excellent mental health were employed compared with 64% and 59% of those with fair to poor mental health. The difference in employment rates was greater for men than for women (21 percentage points versus 18 for physical health, and 18 points versus 11 for mental health).

Chart A Employment and self-reported health



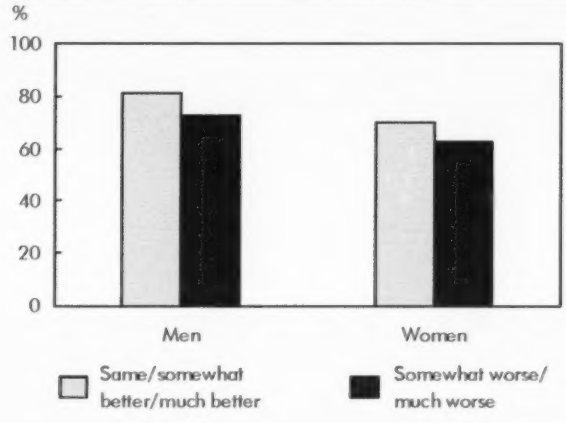
Source: Statistics Canada, 2002 Canadian Community Health Survey, Cycle 1.2, Mental Health and Well-being.

Chart B Employment and presence of health conditions



Source: Statistics Canada, 2002 Canadian Community Health Survey, Cycle 1.2, Mental Health and Well-being.

Chart C Employment and changes in health status[1]



1. Change in self-reported health status from one year ago.
Source: Statistics Canada, 2002 Canadian Community Health Survey, Cycle 1.2, Mental Health and Well-being.

The general conclusion that those with relatively poor physical or mental health are less likely to be employed does not change with the definition of health status. The difference in employment rates among those reporting no health conditions and those reporting at least one was similar for men and women for physical conditions (4.2 percentage points versus 5.6) and almost twice as high for men for mental conditions (9.7 points versus 4.9) (Chart B). The corresponding difference for change in self-reported health status was fairly close (8.1 points for men and 7.7 for women) (Chart C).

Poor health also appears to be related to hours worked (Table 2). Those reporting good to excellent physical health worked more hours than those reporting fair to poor health. The difference was twice as great for women (approximately 3 weeks compared with 1.5 for men). For mental health, the corresponding difference was almost triple (around 4 weeks versus 1.5). Similarly, those reporting no mental health problems were likely to work longer than those reporting at least one, the difference being slightly higher for women. The opposite was true for physical conditions. Those reporting the presence of at least one chronic physical condition worked about two weeks more than those reporting none. Finally, change in health status over the previous year showed almost no difference in

Table 2 Annual hours worked by health status, individuals age 15 to 64

	Men	Women
	hours	
Self-reported physical health		
Good/very good/excellent	2,179	1,719
Fair/poor	2,125	1,611
Self-reported mental health		
Good/very good/excellent	2,177	1,719
Fair/poor	2,122	1,567
Chronic physical conditions		
None	2,144	1,666
At least one	2,214	1,749
Mental health problems		
None	2,190	1,733
At least one	2,075	1,590
Change in health status		
Compared with one year ago current health status is:		
Much better/somewhat better/ about the same	2,174	1,718
Worse/much worse	2,180	1,627

Source: Statistics Canada, 2002 Canadian Community Health Survey, Cycle 1.2, Mental Health and Well-being.

Table 3 Model results for health and employment[1]

	Men	Women
	odds ratio	
Self-reported physical health		
Good/very good/excellent	1.00	1.00
Fair/poor	0.37*	0.56*
Self-reported mental health		
Good/very good/excellent	1.00	1.00
Fair/poor	0.47*	0.69*
Alternative health measure 1		
No chronic physical condition	1.00	1.00
At least one chronic physical condition	0.67*	0.81*
No mental health problem	1.00	1.00
At least one mental health problem	0.58*	0.73*
Alternative health measure 2	coefficient	
Number of chronic physical conditions	-0.36*	-0.17*
Number of mental health problems	-0.21*	-0.16*
Alternative health measure 3	odds ratio	
Compared with one year ago current health status is:		
Much better/somewhat better/ about the same	1.00	1.00
Worse/much worse	0.61*	0.70*

* significant at the 1% level
1. Dependent variable = 1 if employed 0 otherwise.
Note: Models controlled for individual and household characteristics and geographic regions.
Source: Statistics Canada, 2002 Canadian Community Health Survey, Cycle 1.2, Mental Health and Well-being.

hours worked for men reporting a worsening condition compared with the rest. Women whose health improved or stayed the same worked around two weeks more than those whose health deteriorated.

Empirical results

Logistic regressions were used to calculate the odds of having a job (Table 3).[7] The four sets of results relate to four different definitions of health status. For those in fair or poor physical health, the odds of being employed were lower than for those reporting good to excellent health—by 0.63 for men 0.44 for women.[8] Similar figures relating to mental health were 0.53 and 0.31. The first alternative measure of health, presence of a condition, did not change the qualitative conclusion. The presence of at least one physical condition reduced the odds of being employed by 0.33 for men and by 0.19 for women; for mental conditions, the reductions were 0.42 and 0.27.[9] Not only did the presence of a condition affect the odds of being employed but so did the number of conditions. Each additional physical condition decreased the logarithm of the odds of employment by 0.36 for men and 0.17 for women; each additional mental condition, by 0.21 and 0.16. Change in health status from the previous year is an important variable, as it avoids the problem of two-way causality between current health status and current employment status as current employment status is not likely to affect the change in health status over the previous year. The odds of being employed for men whose current health status was worse or much worse than a year ago were lower by 0.39 compared with those whose health status was the same or better. The comparable figure for women was 0.30.

Regardless of how health status was measured, relatively poor health had an adverse effect on the chances of being employed. The next step was to look at the relationship between health and hours worked for those who were employed (Table 4). The results were statistically significant only for women and then only for mental health. Women reporting fair or poor mental health were estimated to work 136 hours (approximately 3.5 weeks) less annually than women in good

Table 4 Model results for health and annual hours worked

	Men	Women
	coefficient	
Self-reported physical health		
Fair/poor	-65.6	-22.5
Self-reported mental health		
Fair/poor	-72.9	-135.8*
Alternative health measure 1		
At least one chronic physical condition	-28.4	11.2
At least one mental health problem	-7.5	-101.8*
Alternative health measure 2		
Number of chronic physical conditions	-8.4	-10.6
Number of mental health problems	-3.5	-37.9*
Alternative health measure 3		
Compared with one year ago current health status is:		
Worse/much worse	31.9	-58.5*

* significant at the 5% level or better
Note: Models controlled for individual and household characteristics, occupation type, job characteristics and geographic regions.
Source: Statistics Canada, 2002 Canadian Community Health Survey, Cycle 1.2, Mental Health and Well-being.

to excellent health. Those with at least one mental health problem were likely to work 102 hours (2.7 weeks) less than those with none. As the number of problems increased, work hours decreased. Each additional mental health problem reduced hours by 38 (one week) per year. Finally, women whose current health status was worse or much worse than one year ago were likely to work 59 fewer hours (1.5 weeks) than those whose health status was the same or better.[10]

The results on hours worked cannot be generalized across the entire population since excluding those without jobs would lead to a sample selection problem (Heckman 1976 and 1979). To overcome this, a Heckman maximum likelihood model was estimated. In the first stage, a probit of participation that included both those working and those not working was estimated. Then the inverse Mills ratio was computed and included in the second stage (hours worked), which was restricted to employed individuals to correct for sample selection bias (Table 5). The results were very similar quantitatively and the qualitative conclusion remained the same—mental health problems are associated with a decrease in hours worked by women.

Table 5 Controlling for selection: health and annual hours worked

	Men	Women
	coefficient	
Self-reported physical health		
Fair/poor	-48.5	-23.7
Self-reported mental health		
Fair/poor	-60.6	-136.5*
Alternative health measure 1		
At least one chronic physical condition	-23.9	10.4
At least one mental health problem	-0.6	-103.1*
Alternative health measure 2		
Number of chronic physical conditions	-5.1	-10.8
Number of mental health problems	-1.1	-38.1*
Alternative health measure 3		
Compared with one year ago current health status is:		
Worse/much worse	39.7	-58.2*

* significant at the 5% level or better
Note: Models controlled for individual and household characteristics, occupation type, job characteristics and geographic regions.
Source: Statistics Canada, 2002 Canadian Community Health Survey, Cycle 1.2, Mental Health and Well-being.

As mentioned, causality between health problems and labour supply measured in the same period is likely to be two-way. Poor health can be associated with adverse labour market outcomes. But, at the same time, adverse labour market outcomes might lead to poor health (especially mental). For example, being unemployed might cause depression. In the absence of a longitudinal dataset, this was partly avoided by using change in health status over the previous year. Another way to address the problem of causality (and selection bias) in a cross-sectional dataset is to use propensity score matching methods (Rosenbaum and Rubin 1983 and 1985, Heckman et al. 1997 and 1998, Dehejia and Wabha 1999 and 2002, and Smith and Todd 2005). The basic idea is to use a statistical matching technique to mimic randomization in control and treatment groups in experimental studies. The control group was those with no health problems and the treatment group was those with health problems. If all observations in the control and treatment groups were similar for all observable characteristics, then having any health problems might explain labour market outcomes accurately (see *Propensity Score Matching Methods* for details).[11] Both self-reported health and presence of a chronic condition had a negative effect on employment (Table 6).[12] Men with fair or poor physical health had a 24 percentage point reduction in their chances of being employed. The reduction for women was 19 points. Similarly, figures for men and women with fair or poor mental health were 21 points and 14 points

Table 6 Propensity score matching methods for health and employment

	Men	Women
	percentage point	
Self-reported physical health		
Fair/poor	-0.24*	-0.19*
Self-reported mental health		
Fair/poor	-0.21*	-0.14*
Alternative health measure 1		
At least one chronic physical condition	-0.08*	-0.05*
At least one mental health problem	-0.11*	-0.08*

* significant at the 1% level
Note: The control variables with which propensity scores are computed are age, education, presence/age of children, and student status. The matching method used is Nearest Neighbour.
Source: Statistics Canada, 2002 Canadian Community Health Survey, Cycle 1.2, Mental Health and Well-being.

Propensity Score Matching Methods

The algorithm proposed by Dehejia and Wabha (2002) to estimate propensity scores was used in this study. Another study (Uppal and Sarma 2007) used this same methodology, as follows, to study the impact of disabilities and chronic illnesses on employment of older men and women.

- Start with a probit model to estimate the propensity score.
- Rank all observations by the estimated propensity score in ascending order.
- Impose the Common Support Restriction (i.e. discard observations that are outside the intersection of the supports of the propensity score of treated and control groups).
- Split the sample into five blocks of equal score intervals and test whether the average propensity scores of treated and control groups are the same in each block.
- Split the interval into halves and test again if the test fails in at least one interval. Continue this step until the average propensity scores of treated and control groups do not differ.
- Test that means of each covariate do not differ between the treated and control groups in each block. This is a necessary requirement for Balancing Hypothesis (i.e. observations with the same propensity score have the same distribution independent of treatment).
- Use a less parsimonious specification if the means of one or more observable characteristics differ.

The STATA program developed by Becker and Ichino (2002) to estimate the propensity score and compute the average treatment effect on the treated groups was used. Following the algorithm, a probit model was estimated to predict the probability of having a physical or mental health problem and test for balancing hypothesis. In all cases, the covariate means were equal at the 5% level of significance. In order to compute the average treatment effect on the treated groups, it was necessary to match the treated and control groups on the basis of propensity scores. In practice, it is almost impossible to match the scores precisely, however, various matching methods are used in literature. In this study, the stratification and the nearest neighbour methods were used. The results presented in this study are from the nearest neighbour method since they were very similar to those from the stratification.

respectively. The effect on hours worked was once again inconclusive for men (Table 7). Whereas self-reported physical and mental health appeared to affect hours worked, the results for the presence of a chronic condition were statistically insignificant. For women, as before, mental health seemed to have a negative effect on hours worked.

The following conclusions can be drawn. Both mental and physical health problems adversely affected the probability of being employed. This effect appeared to be stronger for men than for women. In addition, mental health problems were associated with a decrease in hours worked by women, while the results were inconclusive for men.

Summary

Illness imposes a significant cost on Canadian society. In 1998, the economic burden of illness was $159.4 billion. This is likely much higher today given the aging of the population and the increased likelihood of older cohorts suffering from illnesses. Health problems affect the economy through various channels such as reduced productivity, reduced labour force participation, increased sickness and EI benefits, and costs associated with assistive devices and structural modifications.

One expected impact of poor health status is on employment. In this study, the 2002 CCHS, which had a strong focus on mental health problems, was used to examine the relationship between poor health and labour market outcomes. Approximately 46% of men and 54% of women in the working-age population (15 to 64) had a chronic physical condition. Also, 15%

Table 7 Propensity score matching methods model for health and hours worked

	Men	Women
	percentage point	
Self-reported physical health		
Fair/poor	-91.4*	-82.8*
Self-reported mental health		
Fair/poor	-194.4*	-93.5*
Alternative health measure 1		
At least one chronic physical condition	-14.7	-13.4
At least one mental health problem	-46.8	-87.9*

* significant at the 10% level or better

Note: The control variables with which propensity scores are computed are age, education, presence/age of children, student status, occupation type, and job characteristics. The matching method used is Nearest Neighbour.

Source: Statistics Canada, 2002 Canadian Community Health Survey, Cycle 1.2, Mental Health and Well-being.

of men and 18% of women had a mental health problem. These health problems can affect both home and work activities. Whereas some of the existing literature explores the relationship between physical health/disabilities and labour market outcomes, the relationship with mental health is largely ignored. This study used a source with a strong focus on mental health to study the relationship between mental and physical health problems and employment and hours worked. Various measures of health status and different estimation techniques were used to check for the robustness of the results. Separate models were estimated using self-reported physical and mental health, presence of a chronic physical or mental health condition, the number of chronic physical or mental health conditions, and self-reported change in health over the past year. The study showed that relatively poor mental and physical health decreases the probability of being employed. This adverse effect appeared to be stronger for men. Mental health problems were associated with women working fewer hours.

Perspectives

Note

1. Figures for 2000 will be available shortly.
2. See Tompa (2002) for a discussion on health and productivity.
3. See Marshall (2006) for a discussion of sick leave.
4. Maki 1993, Harkness 1993 and Campolieti 2001 study the impact of disability pensions on labour force participation. These studies by and large conclude that disability pensions have a negative effect on labour force participation. However, Harkness 1993 also finds that a bigger deterrent to labour force participation is the lower expected wage rate due to a disability. Hum and Simpson 1996 and Galarneau and Radulescu 2009 find disability leads to a reduction in hours worked. Campolieti 2002, Morissette et al. 2004 and Pyper 2006 focus on older cohorts and also find a negative relationship between poor health and employment.
5. For more information on the survey, see Statistics Canada (2004a).
6. Mental health conditions refer to prevalence in the 12 months preceding the interview. For more information, see Statistics Canada (2004b).
7. Some labour supply studies focus on individuals age 25 to 59, the core working-age population. This study looked at the population age 15 to 64. Individuals 15 to 24 are more likely to have mental health problems than those 25 to 64, and individuals 60 to 64 are more likely to have physical conditions. Excluding those two age groups would systematically exclude people more likely to have mental or physical health problems. Thus, like Hum and Simpson 1996, the entire working-age population was considered, while controlling for student status and age, among other controls. However, additional analyses on those 25 to 59 showed no qualitative changes in the conclusions.
8. All models used the following control variables: age, age-squared, education, student status, immigrant status, marital status, presence and age of children, and geographic indicators.
9. Mental health and physical health might be expected to be correlated. In the sample used, the Pearson correlation coefficient between the presence of mental and physical health conditions was 0.09 for men and 0.12 for women.
10. In addition to the controls included in the employment model, the hours worked regressions added self-employment status, occupation and work shift.
11. A shortcoming of using propensity score matching for causal inference is that this method is based on the assumption that the selection process depends on observed variables. A bias might arise if the selection is also affected by some unobserved variables.
12. Models were estimated for only two measures of health: self-reported mental and physical health, and presence of a chronic physical condition or mental health problem. The number of chronic physical conditions and mental health problems could not be considered as propensity scores, and can only be computed for binary outcomes. Change in health status was not considered as causal inference, and was not a problem in this case.

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